

TITLE: ATOMIC LAYER DEPOSITION OF METAL OXIDE AND/OR LOW ASYMMETRICAL
TUNNEL BARRIER INTERPLOY INSULATORS

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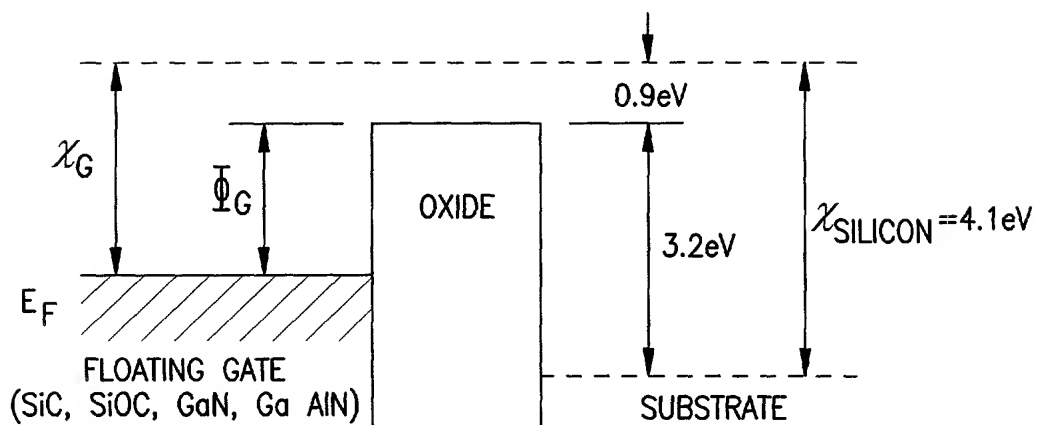


FIG. 1A
(PRIOR ART)

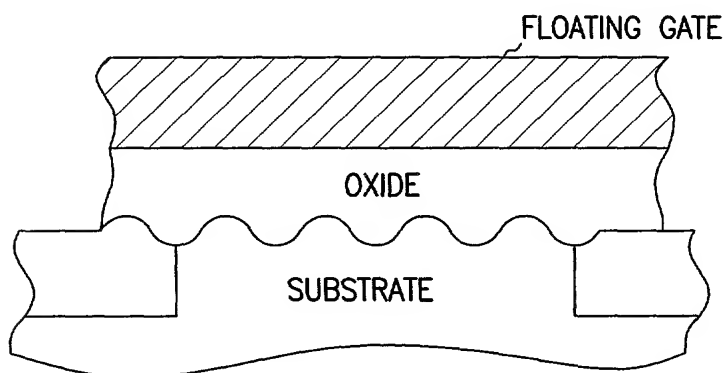


FIG. 1B
(PRIOR ART)

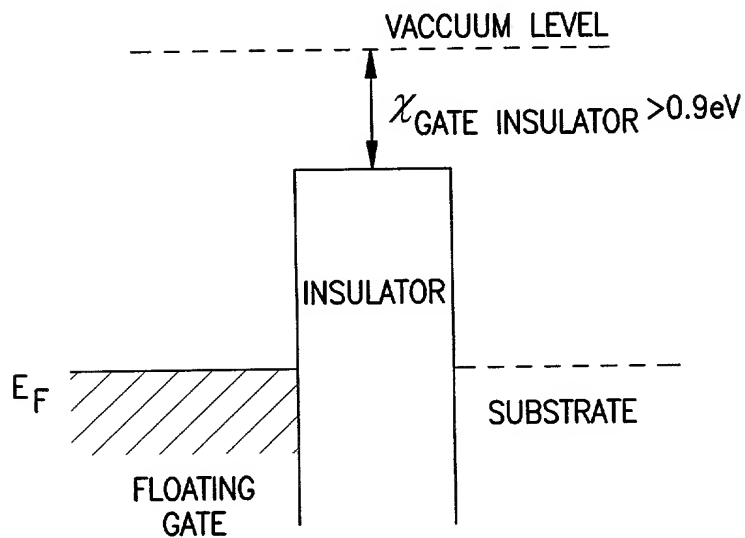


FIG. 1C
(PRIOR ART)

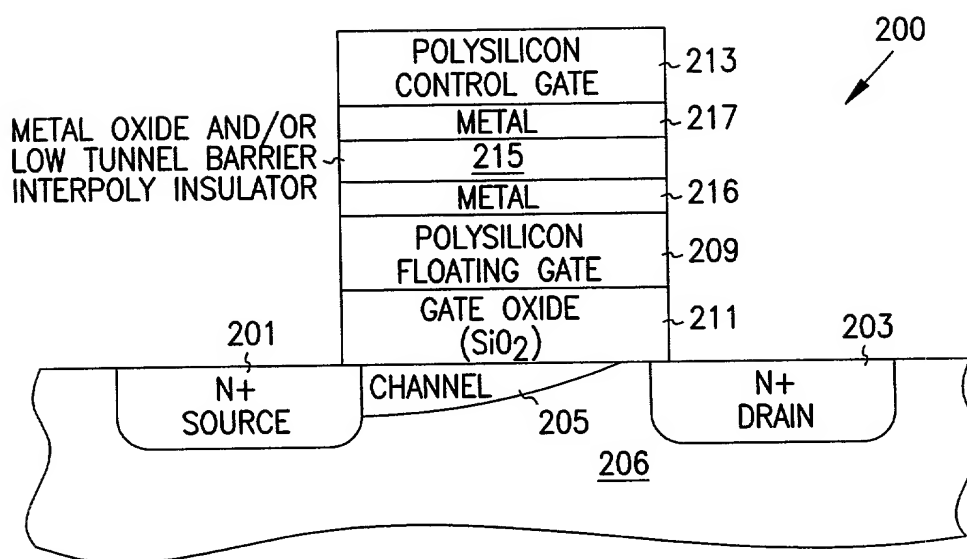


FIG. 2

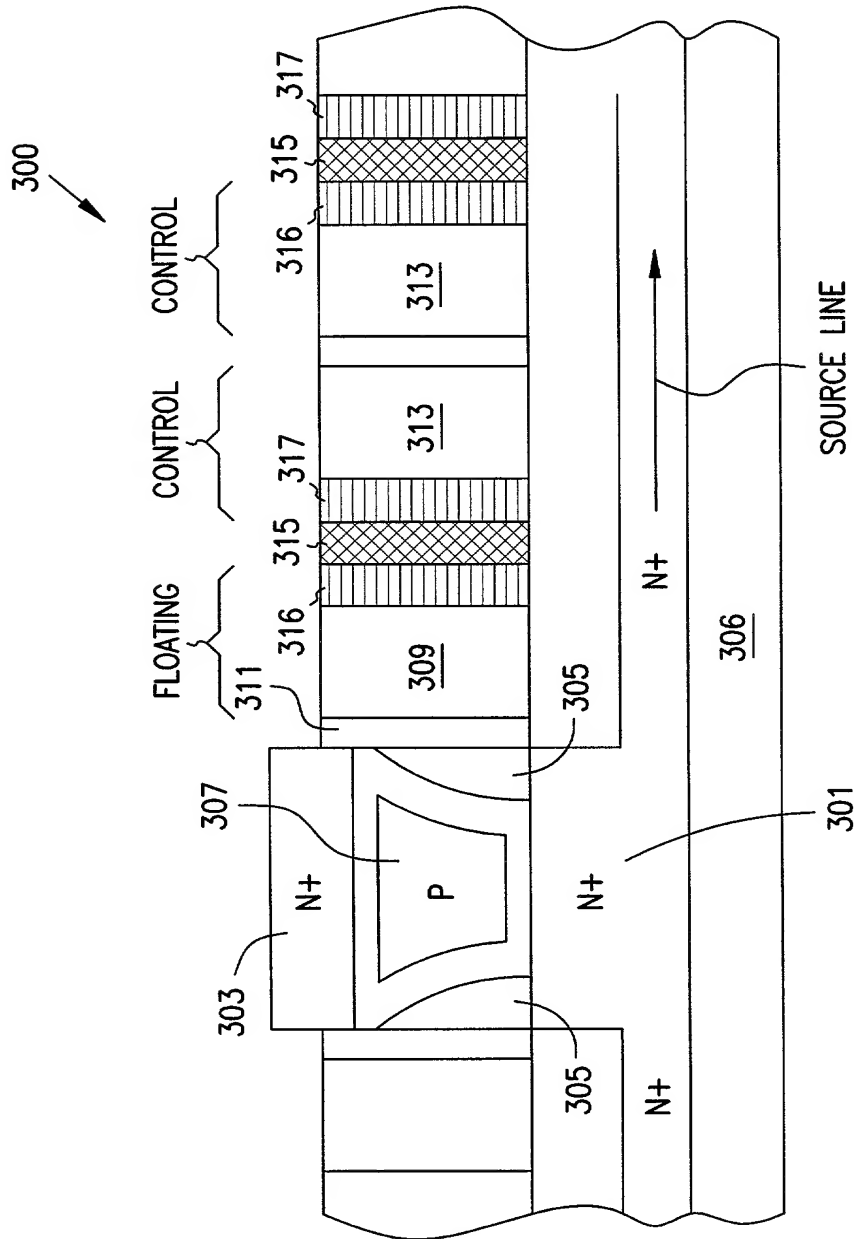


FIG. 3





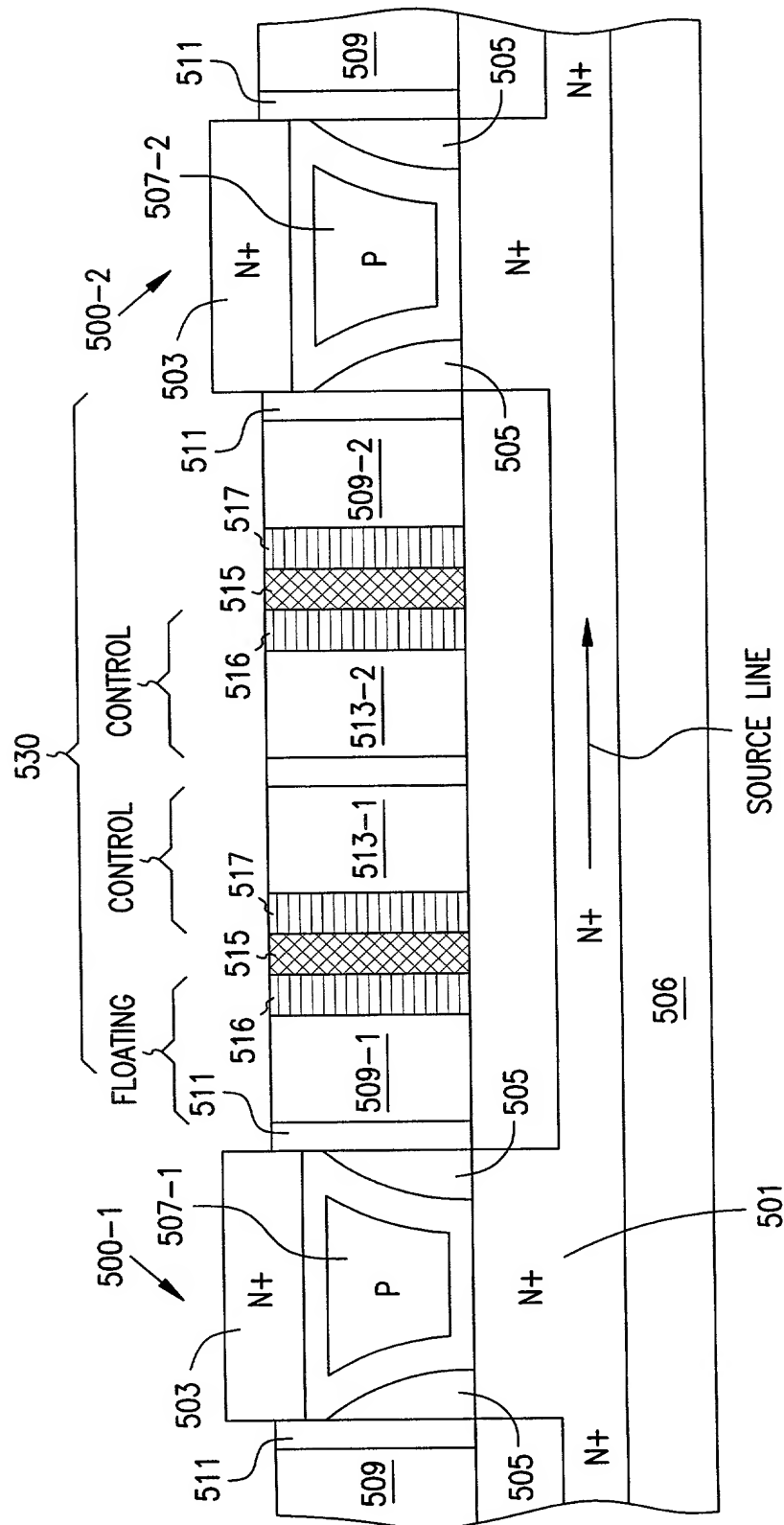


FIG. 5B

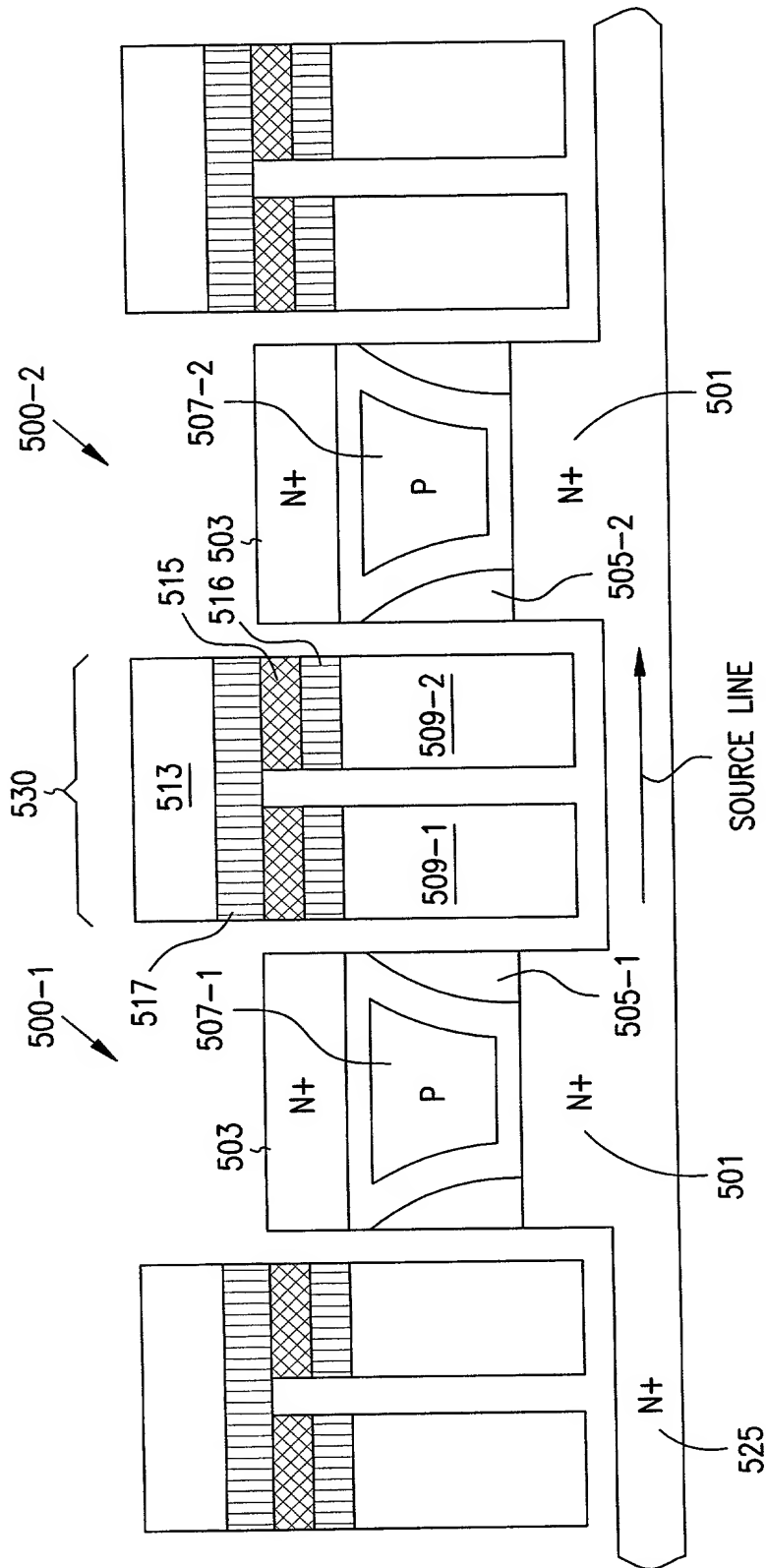


FIG. 5C

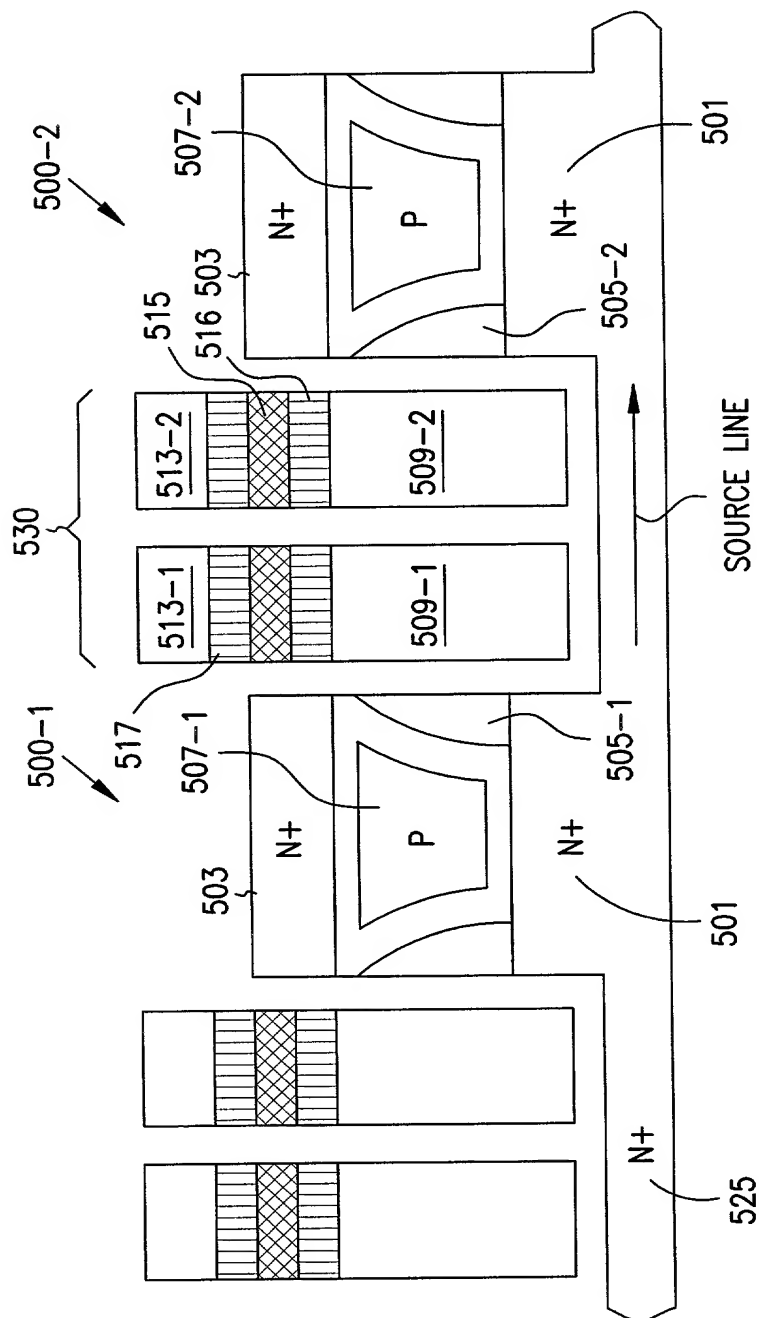


FIG. 5D

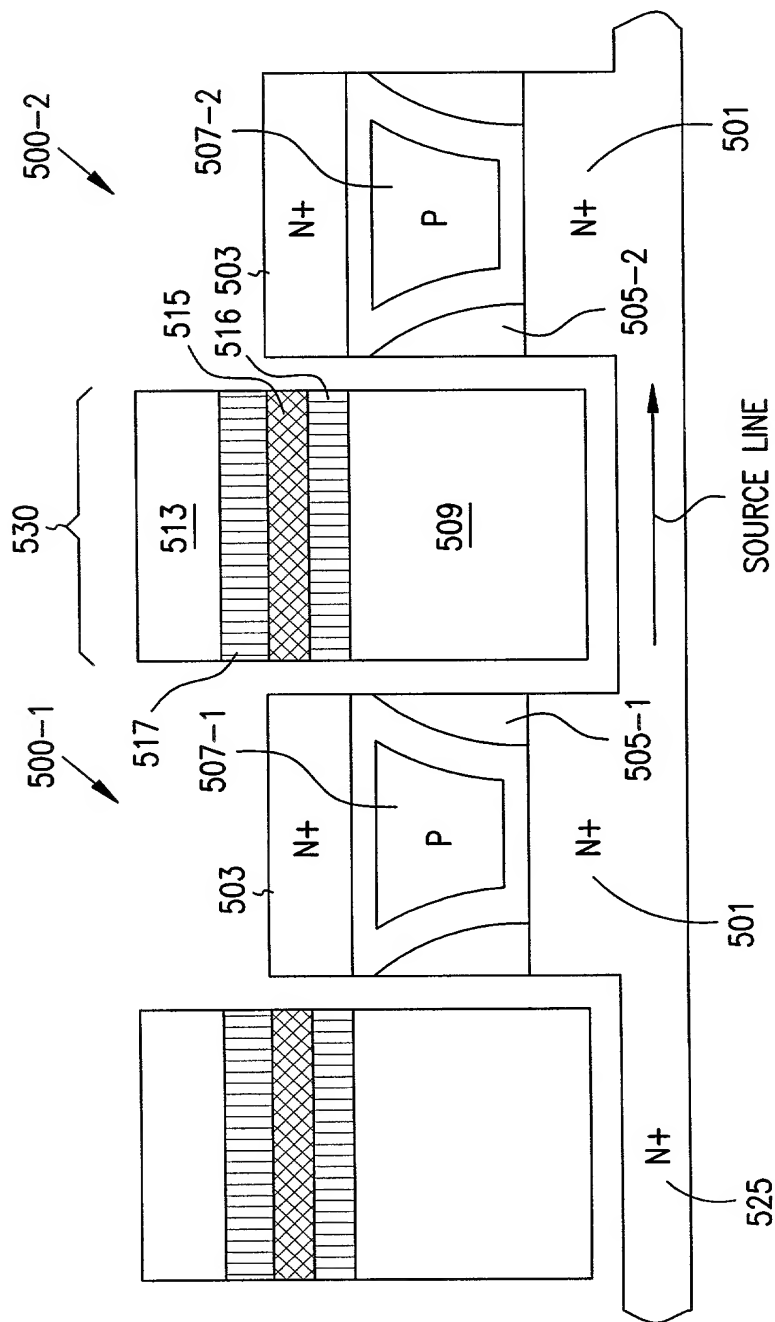


FIG. 5E

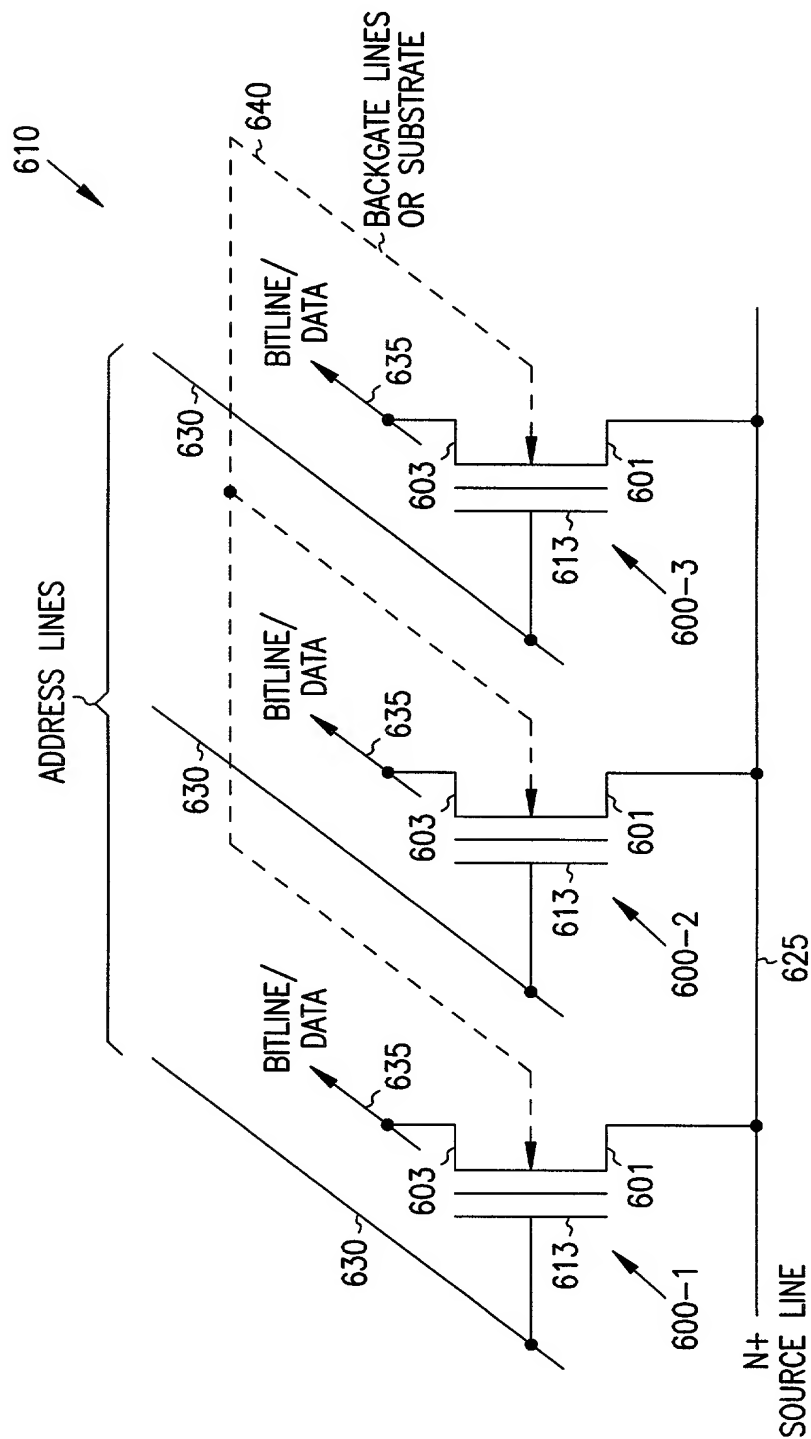


FIG. 6A

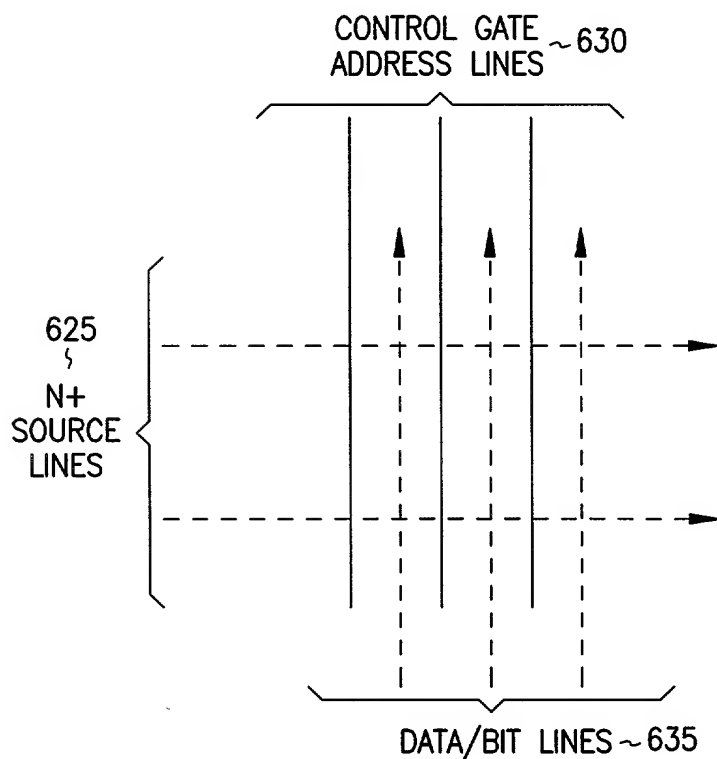


FIG. 6B

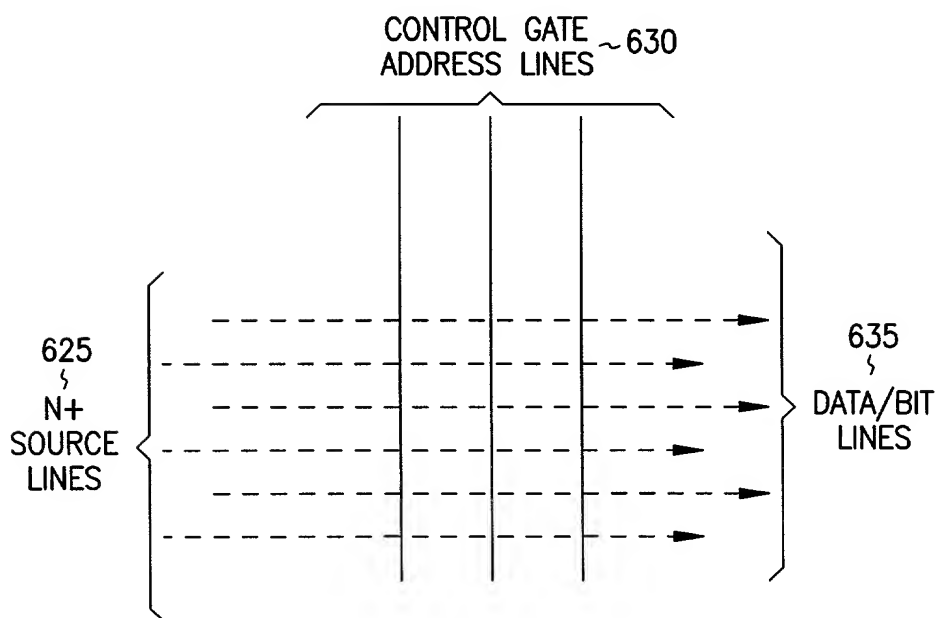


FIG. 6C

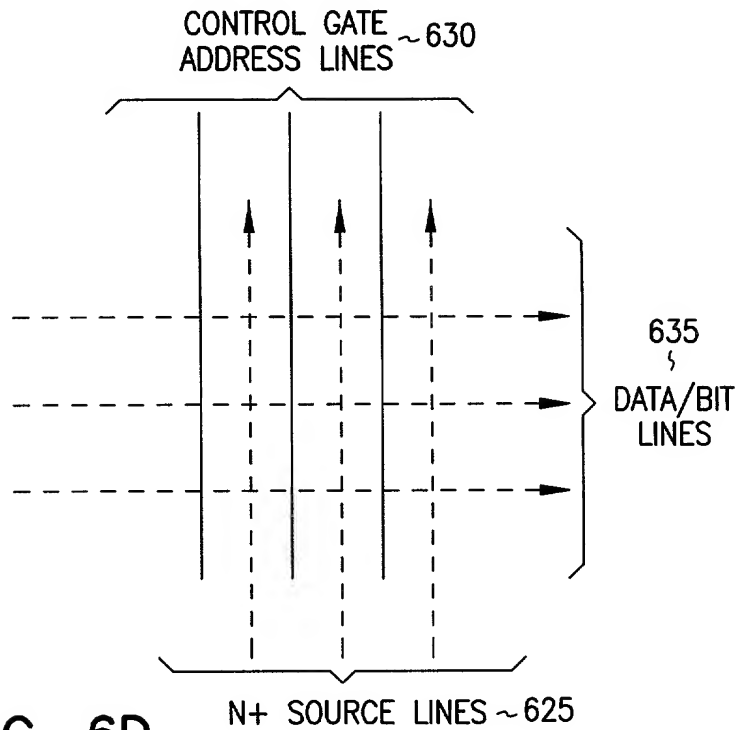


FIG. 6D

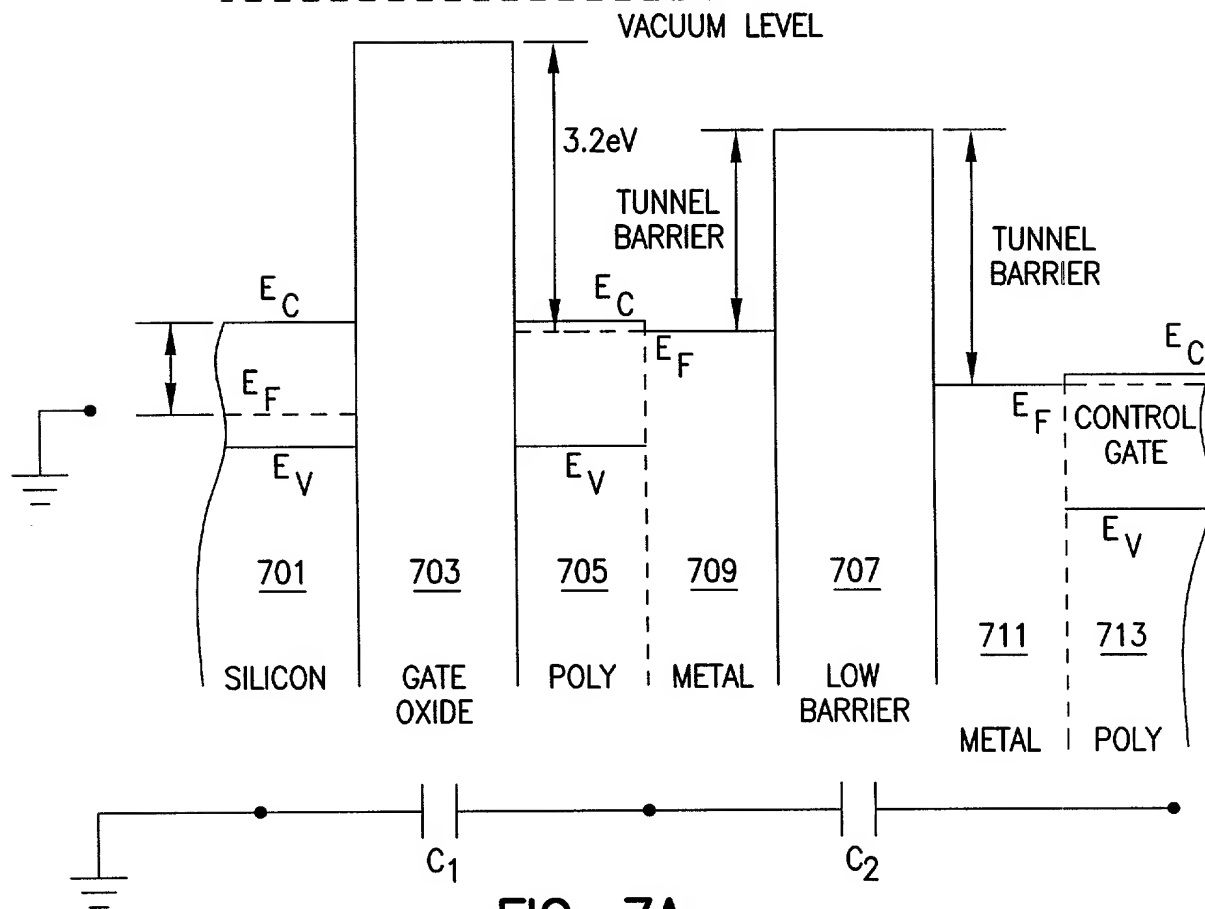


FIG. 7A

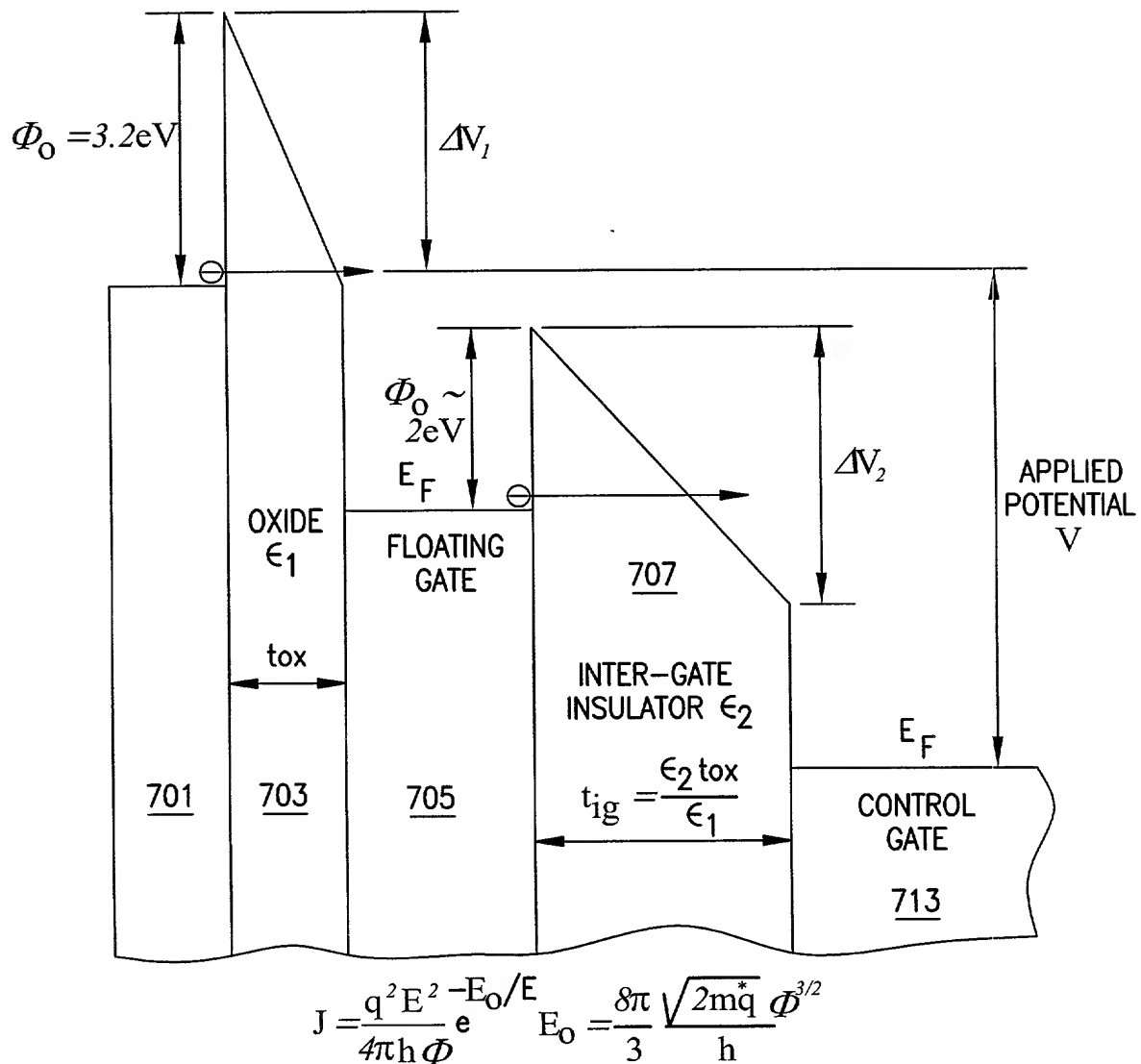


FIG. 7B

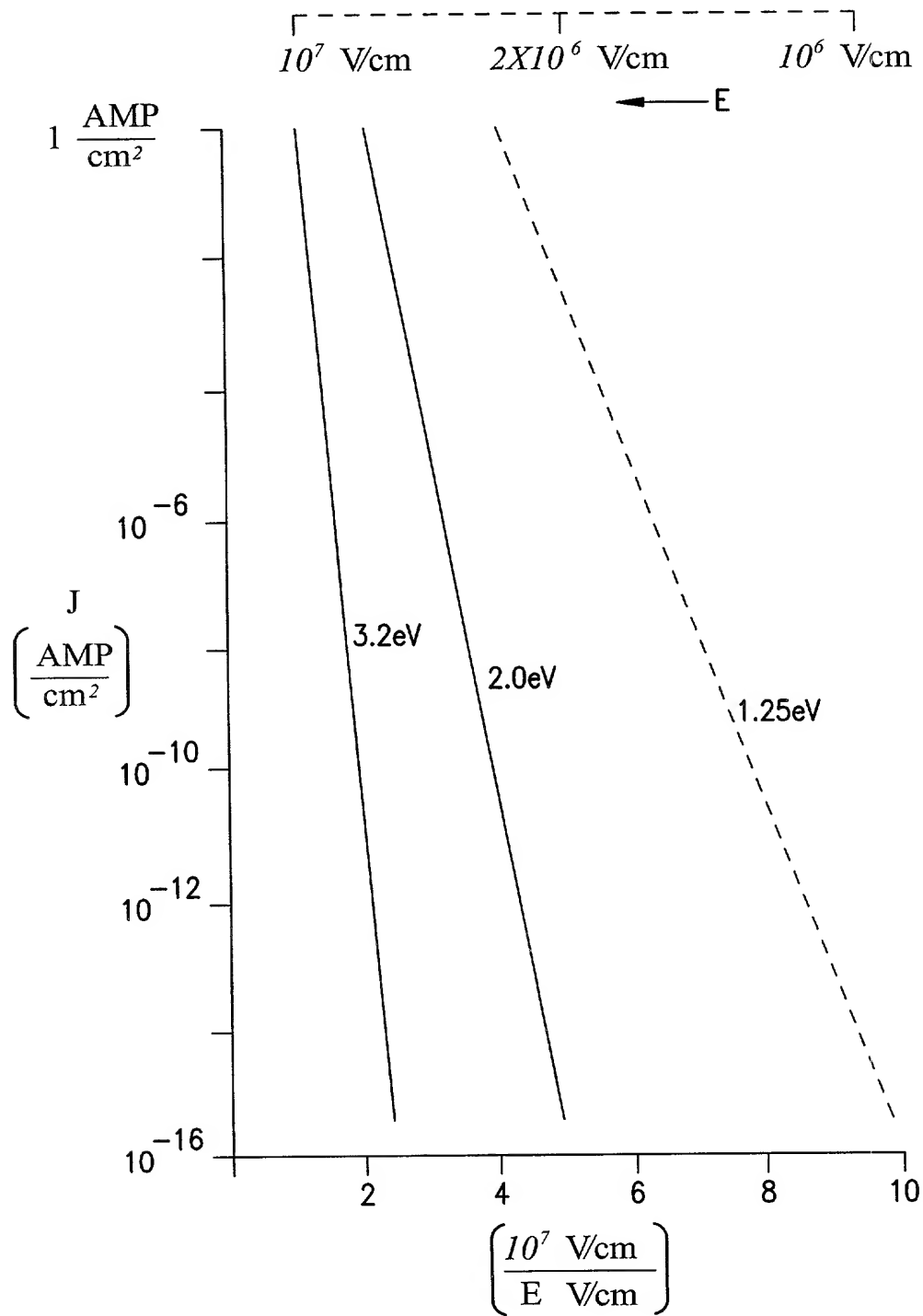


FIG. 7C

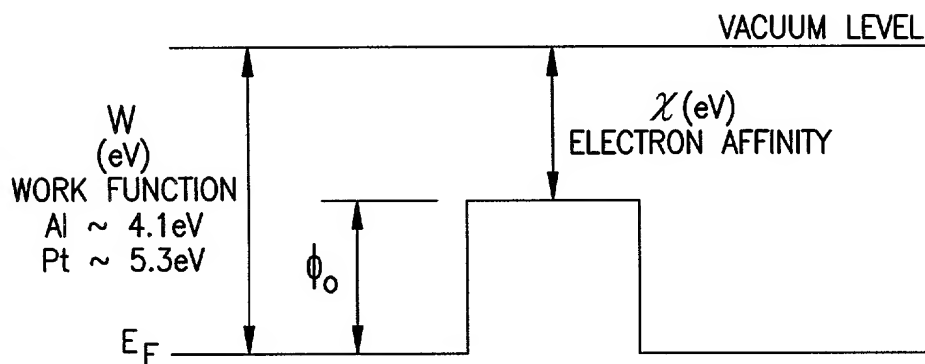


FIG. 8

| | E_G | ϵ_r | ϵ_∞ | χ | ϕ_0 (Pt) | ϕ_0 (Al) |
|--|-------------|--------------|-------------------|--------|----------------|---------------|
| <u>Conventional Insulators</u> | | | | | | |
| SiO ₂ | ~ 8 eV | 4 | 2.25 | 0.9 eV | | 3.2 eV |
| Si ₃ N ₄ | ~ 5 eV | 7.5 | 3.8 | | | 2.4 eV |
| <u>Metal Oxides</u> | | | | | | |
| Al ₂ O ₃ | 7.6 eV | 9 to 11 | 3.4 | | | ~ 2 eV |
| NiO | | | | | | |
| <u>Transition Metal Oxides</u> | | | | | | |
| Ta ₂ O ₅ | 4.65 - 4.85 | | 4.8 | 3.3 | 2.0 | 0.8 eV |
| TiO ₂ | 6.8 | 30 80 | 7.8 | 3.9 | est. 1.2 eV | |
| ZrO ₂ | 5 - 7.8 | 18.5 25 | 4.8 | 2.5 | | 1.4 |
| Nb ₂ O ₅ | 3.1 | 35-50 | | | | |
| Y ₂ O ₃ | 6 | | 4.4 | | | 2.3 |
| Gd ₂ O ₃ | | | | | | |
| <u>Perovskite Oxides</u> | | | | | | |
| SrBi ₂ Ta ₂ O ₃ | 4.1 | | 5.3 | 3.3 | 2.0 | 0.8 eV |
| SrTiO ₃ | 3.3 | | 6.1 | 3.9 | 1.4 | 0.2 eV |
| PbTiO ₃ | 3.4 | | 6.25 | 3.5 | 1.8 | 0.6 eV |
| PbZrO ₃ | 3.7 | | 4.8 | | est. 1.4 eV | 0.2 eV |

FIG. 9

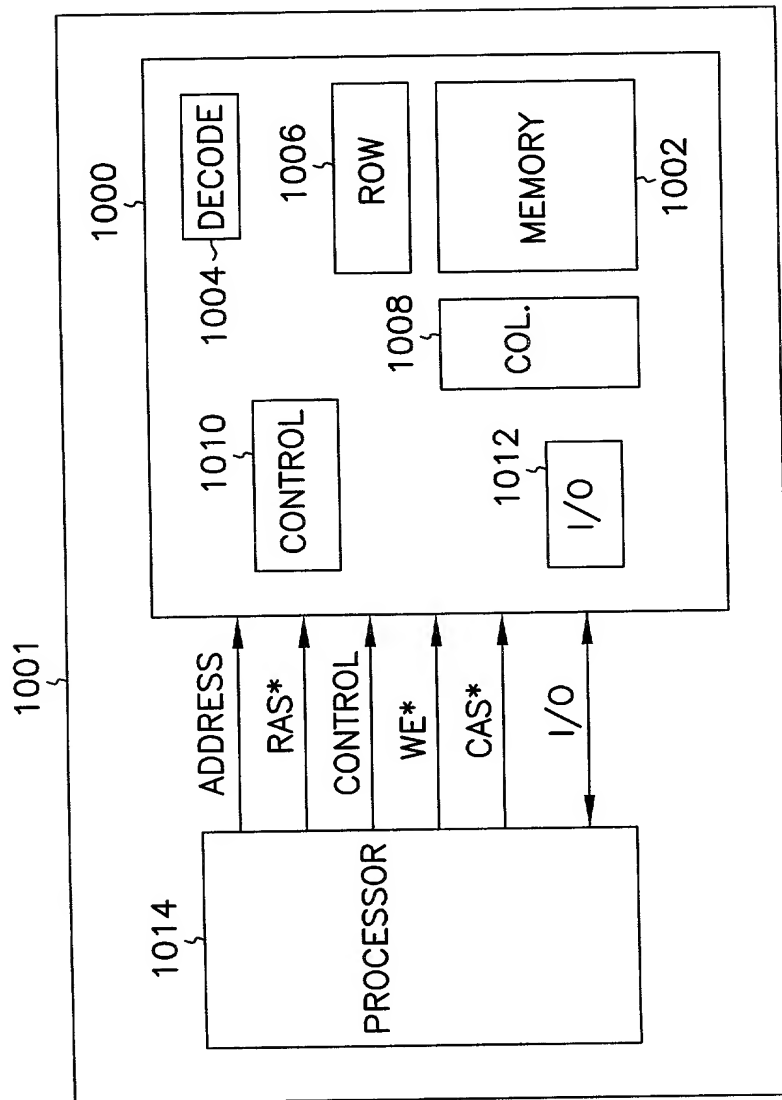


FIG. 10